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Claims

[c1] 1. A method for fabricating a contact, comprising the steps of:
providing a substrate;
forming a patterned first material layer over the substrate, wherein the first material layer is fabricated from a first conductive material;
performing a treatment process to transform a portion of the first material layer into a second material layer with insulating properties, wherein the second material layer is formed on sidewall sections and a top section of the first material layer;
forming a dielectric layer over the second material layer and the substrate; and
removing a portion of the dielectric layer and the second material layer to expose the first material layer.

[c2] 2. The method of claim 1, wherein after removing a portion of the dielectric layer and the second material layer, further comprises:
removing the first material layer to form a contact opening; and
depositing a second conductive material into the contact

opening to form a contact.

[c3] 3. The method of claim 1, wherein the first conductive material comprises a substance selected from the group consisting of aluminum, silicon or copper.

[c4] 4. The method of claim 1, wherein the treatment process includes a chemical reaction in which a speed of the reaction is limited by a diffusion mechanism.

[c5] 5. The method of claim 4, wherein the chemical reaction is an oxidation process, a nitridation process, a hydrogenation process or a fluorination process.

[c6] 6. The method of claim 2, wherein the second conductive material comprises chalcogenide.

[c7] 7. A method for fabricating a contact, comprising the steps of:
providing a substrate;
forming a patterned first material layer over the substrate;
performing a treatment process to transform a portion of the first material layer into a second material layer with insulating properties, wherein the second material layer is formed on sidewall sections and a top section of the first material layer and the second material layer has properties different from the first material layer;

forming a dielectric layer over the second material layer and the substrate; and

removing a portion of the dielectric layer and the second material layer to expose the first material layer.

[c8] 8. The method of claim 7, wherein the first material layer comprises a first conductive material.

[c9] 9. The method of claim 8, wherein the first conductive material layer comprises a substance selected from the group consisting of aluminum, silicon or copper.

[c10] 10. The method of claim 7, wherein after the step of removing the portion of the dielectric layer and the second material layer, the method further comprises:

removing the first material layer to form a contact opening; and

depositing a second conductive material into the contact opening to form a contact.

[c11] 11. The method of claim 10, wherein the first material layer comprises a first conductive material.

[c12] 12. The method of claim 11, wherein the first material layer comprises a material selected from the group consisting of aluminum, silicon and copper.

[c13] 13. The method of claim 10, wherein the first material

layer comprises a nonconductive material.

[c14] 14. The method of claim 13, wherein the first material layer comprises a polymer material.

[c15] 15. The method of claim 10, wherein the second conductive material comprises chalcogenide.

[c16] 16. The method of claim 7, wherein the treatment process includes a chemical reaction in which a speed of the reaction is limited by a diffusion mechanism.

[c17] 17. The method of claim 16, wherein the chemical reaction is an oxidation process, a nitridation process, a hydrogenation process or a fluorination process.

[c18] 18. A method for fabricating a contact, comprising the steps of:
providing a substrate having at least one linear stack structure thereon such that the linear stack structure comprises a bottom conductive layer and a top first material layer, wherein the first material layer is fabricated from a first conductive material;
forming a first dielectric layer over the substrate such that the first dielectric layer exposes a top section of the linear stack structure;
forming at least one linear conductive layer over the linear stack structure such that the linear conductive layer

is oriented in a direction perpendicular to the linear stack structure;

removing the first material layer not covered by the linear conductive layer to expose the conductive layer; and

performing a treatment process to transform a portion of the first material layer into a second material layer with an insulating property, wherein the second material layer is formed on thesidewall section of the first material layer.

[c19] 19. The method of claim 18, wherein the first conductive material comprises a substance selected from the group consisting of aluminum, silicon and copper.

[c20] 20. The method of claim 18, wherein the treatment process includes a chemical reaction in which a speed of the reaction is limited by a diffusion mechanism.

[c21] 21. The method of claim 20 wherein the chemical reaction is an oxidation process, a nitridation process, a hydrogenation process or a fluorination process.

[c22] 22. The method of claim 18, wherein the method for removing the first material layer not covered by the linear conductive layers comprises etching using the linear conductive layers as self-aligned masks.

[c23] 23. A method for fabricating a contact, comprising:

providing a substrate having at least one linear stack structure thereon such that the linear stack structure comprises a bottom conductive layer and a top first material layer;

forming a first dielectric layer over the substrate such that the first dielectric layer exposes a top section of the linear stack structure;

forming at least one linear sacrificial layer over the linear stack structure such that the linear sacrificial layers are oriented in a direction perpendicular to the linear stack structure;

removing the first material layer not covered by the linear sacrificial layer to expose the conductive layer;

performing a treatment process to transform a portion of the first material layer into a second material layer with insulating properties, wherein the second material layer is formed on sidewall sections of the first material layer and the second material layer has properties different from the first material layer;

removing the linear sacrificial layers; and

forming a second dielectric layer over the substrate to cover the conductive layer but expose top sections of the first material layer and the second material layer.

[c24] 24. The method of claim 23, wherein subsequent to the step of exposing the top sections of the first material

and the second material layer, the method further comprises:

removing the first material layer to form a plurality of contact openings; and

depositing a conductive material into the contact openings to form an array of contacts.

[c25] 25. The method of claim 23, wherein subsequent to the treatment process, the method further comprises:

forming a second dielectric layer on the substrate to cover the linear sacrificial layer but expose the top sections of the linear sacrificial layer;

removing the linear sacrificial layer; and

exposing the top sections of the first material layer and the second material layer.

[c26] 26. The method of claim 25, wherein subsequent to the step of exposing the top sections of the first material and the second material layer, the method further comprises

removing the first material layer to form a plurality of contact openings; and

depositing a conductive material into the contact openings to form an array of contacts.

[c27] 27. The method of claim 23, wherein the first material layer comprises a polymer material.

[c28] 28. The method of claim 23, wherein the first material layer comprises a substance selected from the group consisting of aluminum, silicon and copper.

[c29] 29. The method of claim 23, wherein the treatment process includes a chemical reaction in which a speed of the reaction is limited by a diffusion mechanism.

[c30] 30. The method of claim 28, wherein the chemical reaction is an oxidation process, a nitridation process, a hydrogenation process or a fluorination process.

[c31] 31. The method of claim 25, wherein the conductive material comprises chalcogenide.

[c32] 32. The method of claim 23, wherein the method of removing the first material layer not covered by the linear sacrificial layer comprises etching using the linear sacrificial layers as self-aligned masks.